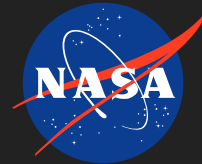


Integrated Energetic Ion Mitigation for High Power Plasma Cathodes, Phase I

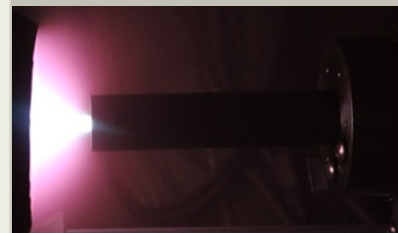
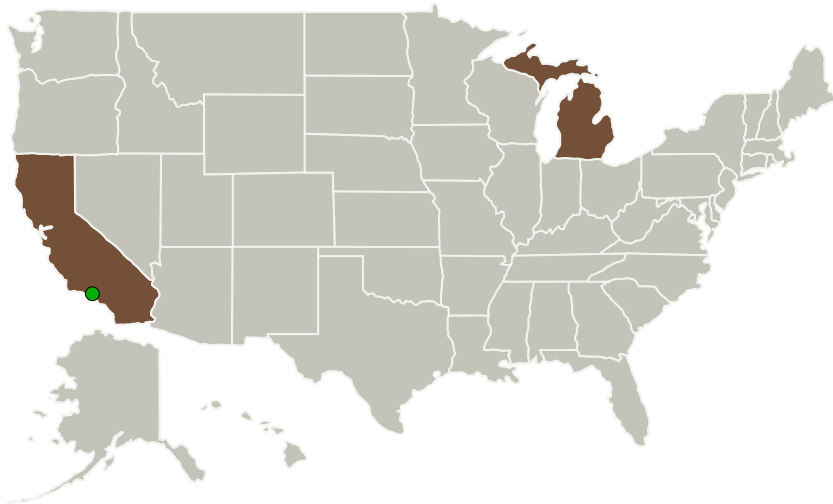
Completed Technology Project (2015 - 2015)



Project Introduction

The innovation proposed is a hollow cathode that integrates mitigation methods to suppress wear to the keeper. Recent advances in the magnetic topology in Hall thrusters has eliminated erosion of the thruster walls. As such the life limiting component of Hall thrusters has shifted to the cathode lifetime. Under a previous investigation aimed at understanding the impact of high energy ions in high current hollow cathodes, we mapped the energy spectra of cathode derived ions for both a barium oxide hollow cathode and a LaB6 hollow cathode. Energetic ions were clearly present and their intensity and peak energy tended to increase with increasing discharge current. Preliminary mitigations experiments showed promise in the use of an externally applied magnetic field as a way to reduce the peak energy of the emitted ion flux. The overall goal of this proposal is to produce a hollow cathode with integrated energetic ion mitigation technology. This cathode will be tested in magnetic field environments characteristic of Hall and gridded ion engines. It will provide a good body of experimental evidence of how to successfully mitigate cathode erosion for the high powered thrusters currently under development. Additionally, an energetic ion mitigation method could be directly integrated into the cathode design for the recently proposed Asteroid Retrieval Mission (ARM) which is currently baselined to use 4-5 10 kW class magnetically shielded Hall thrusters.

Primary U.S. Work Locations and Key Partners



Integrated Energetic Ion Mitigation for High Power Plasma Cathodes, Phase I

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Integrated Energetic Ion Mitigation for High Power Plasma Cathodes, Phase I

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Organizations Performing Work	Role	Type	Location
ElectroDynamic Applications, Inc.	Lead Organization	Industry Minority-Owned Business	Ann Arbor, Michigan
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

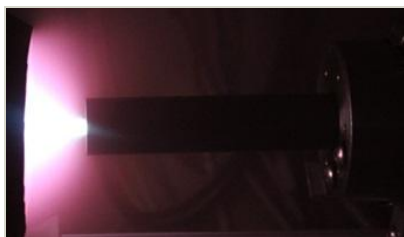
California	Michigan
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Project Transitions

**June 2015:** Project Start**December 2015:** Closed out**Closeout Summary:** Integrated Energetic Ion Mitigation for High Power Plasma Cathodes, Phase I Project Image**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/139118>)

Images

**Briefing Chart Image**

Integrated Energetic Ion Mitigation for High Power Plasma Cathodes, Phase I

(<https://techport.nasa.gov/image/128645>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ElectroDynamic Applications, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

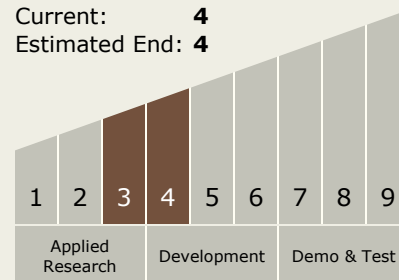
Program Manager:

Carlos Torrez

Principal Investigator:

Christopher Davis

Technology Maturity (TRL)

Start: **3**Current: **4**Estimated End: **4**

Integrated Energetic Ion Mitigation for High Power Plasma Cathodes, Phase I

Completed Technology Project (2015 - 2015)



Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.2 Electric Space Propulsion
 - └ TX01.2.2 Electrostatic

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System